made rainfall and river-gage readings frequently during day and night; of the aid given by United States engineers who, particularly in one case, assigned two of their employees at Marysville to help our river observer during the emergency, the engineers, in day and night shifts taking hourly readings and answering hundreds of telephone calls as to the behavior of the river; also of the valuable cooperation of the telephone and telegraph companies, the radio and the press, in distributing warnings.

In this connection it should be stated that the Red Cross and other agencies promptly provided all necessary relief and rescue facilities throughout the Valley.

NOTES AND REVIEWS

O. HOELPER. *Atmosphärische Trübungs-und Wasserdampfbestimmungen nach Filtermessungen der Sonnenstrahlung.* Reichsamt für Wetterdienst, Wiss. Abh. *5*, n. 10, 49 pp., Berlin, 1939

Filter measurements of solar radiation, and their reduction by Ångström's method to obtain dust turbidity and precipitable water in the atmosphere, are here published for Potsdam, Schomberg, Davos, and Zugspitze. Data for Aachen have already appeared (Deutsches Met. Jahrb. Aachen für 1933, 55–62, 1935).

The practical difficulties in the way of getting sufficiently accurate solar radiation measurements seem to have been to a large degree responsible for the limited use of this theoretically very simple method for getting the total moisture content of the atmosphere above any station. These difficulties are here reviewed. It is pointed out that concurrent readings from several stations all within the same air mass have helped to remove some of the errors; conversely, agreement in the results of independent and well-separated simultaneous observations has emphasized the uniformity in some of the characteristics of an extended air mass.

Theoretical difficulties of the Ångström method, such as the assumption of a mean effective size of scattering particle, and the anomalous behavior of scatter in the UV region, are claimed to be of little consequence in view of the rough nature of the required characterizations of the atmosphere.

Hoelper sets up a transformation table to put the results of observations at Blue Hill and Washington (published in the MONTHLY WEATHER REVIEW, 1933–37) in terms of the European reductions. Much of the disparity in the Blue Hill results is supposed by Hoelper, as by Kimball, to be probably traceable to improper filter transmission factors. It may be mentioned here that in September 1938 it was discovered at Blue Hill that both the OG–I and the RG–2 Jena glass filters, continually exposed there in clear or partly cloudy weather during the previous 5 years, had steadily deteriorated by crystallization at and just below the glass surfaces. Subsequent development of an empirical method for estimating the curve of transmission decrease of these filters with advancing time made possible the reevaluation of Blue Hill turbidity measurements now under way.

Hoelper discusses a new method for correcting the reductions to turbidity and water-vapor content on nonnormal days. It was found that observations indicating extremely high or low turbidity did not yield true values of precipitable water by the usual reductions. By the use of simultaneous airplane observations of atmospheric moisture content, a correction curve may be developed for any station, based on the differences between the precipitable water found by the two methods, plotted against the differences in the corresponding turbidity coefficient obtained from two spectral regions. This curve permits adjustment of the quantity of precipitable water obtained through radiation measurements and use of the corrected quantity to obtain a truer value of the turbidity. A few successive approximations suffice for even the most extreme conditions. It is felt by Hoelper that this method provides, where necessary, at least a partial correction for the Ångström approximation in assuming a mean effective size of scattering particle.

Another subject discussed by the author is the frequently observed inconsistency between the surface vapor pressure and the precipitable water as obtained by the filter method. The mean relation between the two does not conform to theory, for a nonlinearity appears when they are plotted in a scatter diagram. This is similar to the nonlinearity found in recent spectrographic measures of water-vapor absorption when plotted against the corresponding surface vapor pressure (Herzing, *Gerl. Beitr.* *49*, 71, 1937). It seems to be accounted for by considering Fowle's absorption F, due to water vapor, not as a mean function of $W \cdot m$ (where m is the optical air mass) but as a family of curves, each of constant m. It then appears that for large m, F falls below the mean F for all W; and for small m, F lies above the mean F. Thus an observed F in winter (with relatively large m) should yield a much higher value of $W \cdot m$ than the same F in summer. It is of course understood that the preceding correction only partially meets the difficulties inherent in approximating the total precipitable water from the surface vapor pressure.

Perhaps the outstanding contribution of this paper is in calling attention to the importance of essentially simultaneous solar observations. Confirmation of the results of one set of observations by the results of an entirely independent set is one of the fundamental "controls" in scientific research. For estimating the effects of the especially numerous known and unknown sources of error afflicting solar radiation measurements, particular emphasis on concurrent observations offers one of the most important possibilities.—*Edmund Schulman.*

W. W. SPANGENBERG. *Strahlungs—Klimatologische Betrachtungen.* Aus d. Archiv d. deutschen Seewarte, *58*, n. 8, 32 pp., 1938.

The author compares the mean monthly values of transmission, turbidity, and maximum intensity of both the total and the red-infrared radiation at eight stations of varying elevation in central Europe. The differences are discussed in terms of variations of the climatic elements in place and time.

Of especial interest is the discussion of intensity fluctuations of a few minutes duration. In absolute value as well as in percent, these fluctuations are shown to vary inversely with the solar elevation, for the total as well as for the less fluctuating red radiation. Variations up to 30 percent for large air masses are found. Wind, in combination with stratified or otherwise heterogeneous distribution of dust and other scattering and absorbing particles, is held to be the causative agent. The effect of the lowest layers of the atmosphere in introducing long-period (month-to-month) variations in radiation is emphasized; at relatively high solar elevations these variatinos apparently smooth out.—*Edmund Schulman.*